Flow Sensor Calibration

NOTE: The following calibration should be performed after any repair has been performed on the REMstar Pro CPAP System.

Equipment Setup

NOTE: Refer to Figures 8-2 and 8-3 for proper connections to perform flow calibration.

- Remove the O_2 adapter and monometer from the outlet of the REMstar Pro.
- Connect one piece of patient tubing between the REMstar Pro and the flow meter.
- Connect one piece of patient tubing between the flow meter and the flow valve.
- Connect one piece of patient tubing between the flow valve and the negative flow source.

Step 1 Flow Offset

a. Press the right user button 1 time to reach the **FOFS7** (flow offset) screen.

b. Press the humidifier or ramp button to adjust the flow offset. When the numbers on the display screen stop, the process is complete.

Step 2 Flow Cal

a. Press the right user button 1 time to reach the **FCAL** (flow cal) screen.

b. Press the ramp button to null the flow table.

c. Press the humidifier button to start the flow cal. The display screen will be flashing **-120**.

d. Turn on the negative flow source.

e. Adjust the flow valve until the flow meter reads -120 lpm.

f. Press the Start / Stop button to preceed to the next value on the display screen.

g. Adjust the flow valve and press the Start / Stop button for each setting that appears on the display screen. When the display screen reaches **0.0** stop.

REMstar Pro CPAP System Calibration (Continued)

h. Turn off the negative flow source. Disconnect the negative flow source and the patient tubing from the flow valve.

i. The display screen should be flashing **0.0**. Press the Start / Stop switch.

j. Adjust the flow valve and press the Start / Stop button for each setting that appears on the display screen.

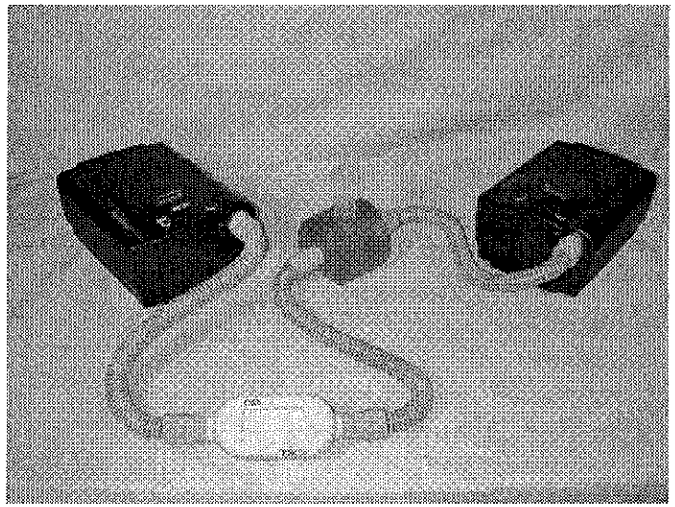

Figure 8-2
Flow Calibration (Negative Flow)

k. When the calibration @ 120 lpm is complete, the display will stop flashing and will show the flow as measured by the calibrated flow sensor..

l. Calibration is complete. Disconnect the REMstar Pro form the power source.

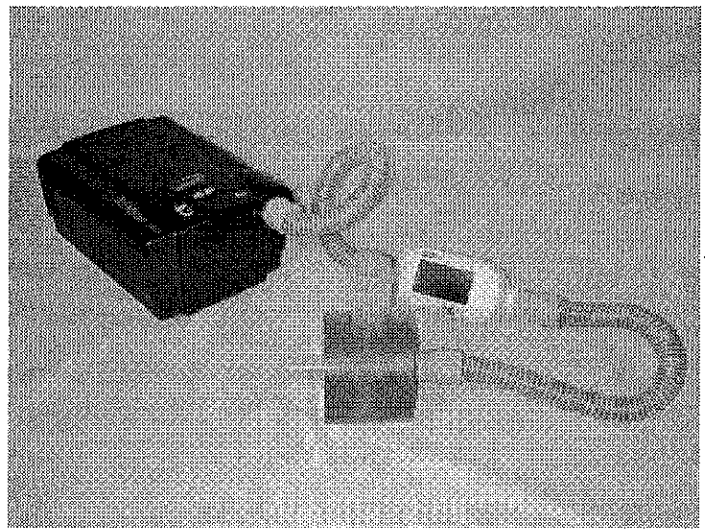

Figure 8-3
Flow Calibration (Positive Flow)

8.4 REMstar Pro CPAP System Final Test

Purpose

This procedure provides instructions for the REMstar Pro CPAP System Final Test.

CAUTION: Electronic components used in this device are subject to damage from static electricity. Use and follow appropriate Electro-Static Discharge (ESD) procedures.

Equipment

O_2 Enrichment Attachment

Pressure tubing

Outlet end cap

Manometer

6 ft. Patient tubing

Whisper Swivel II

Step 1 Setup

a. Connect one end of the patient tubing to the outlet of the REMstar Pro.

b. Connect the Whisper Swivel II to the other end of the 6 ft. patient tubing.

c. Connect the O_2 enrichment port to the Whisper Swivel II.

d. Place the outlet end cap on the O_2 enrichment port.

e. Connect the pressure tubing between the manometer and the O_2 enrichment port.

Step 2 4 cm H_2O Pressure

a. Enter the Setup menu and set the pressure to 4 cm H_2O. (See Section 4.2 for instructions).

b. Turn the UUT blower on and allow the unit to stabilize for 1 minute.

c. Record the pressure reading of the manometer in the space provided on the Testing Data Sheet.

Step 3 20 cm H_2O Pressure

a. Enter the Setup menu and set the pressure to 20 cm H_2O. (See Section 4.2 for instructions).

b. Turn the UUT blower on and allow the unit to stabilize for 1 minute.

c. Record the pressure reading of the manometer in the space provided on the Testing Data Sheet.

8.5 Respironics Heated Humidifier Test

Purpose

This procedure provides instructions for the Heated Humidifier System Test.

CAUTION: Electronic components used in this device are subject to damage from static electricity. Use and follow appropriate Electro-Static Discharge (ESD) procedures.

Equipment

REMstar Pro CPAP System

Test Orifice (see Appendix A)

1 piece of pressure tubing

Step 1 Humidifier Preheat Test

a. Connect the REMstar Pro CPAP System to the Heated Humidifier (See Section 4.5 for instructions.)

b. Set the Heated Humidifier setting to 1.

c. Start the preheat mode and observe the following:

1. The icon appears on the CPAP display screen.
2. The green LED on the front of the Heated Hunidifier is illuminated.

d. Record the results on the Testing Data Sheet.

Step 2 Humidifier Heat Test

a. All connections remain the same as in step 1.

b. Turn the UUT blower on and observe that the green LED on the front of the Heated Humidifier is a solid green LED.

c. Observe heater plate warms.

d. Record the results on the Test Data Sheet.

8.6 Current Draw Test

Purpose

This procedure provides instructions for testing the current draw on the REMstar Pro CPAP System, the Respironics Heated Humidifier or both units together.

CAUTION: Electronic components used in this device are subject to damage from static electricity. Use and follow appropriate Electro-Static Discharge (ESD) procedures.

Equipment

REMstar Pro CPAP System

Test Orifice (see Appendix A)

1 piece of pressure tubing

Multimeter

Test leads

NOTE: The Water Chamber does not need to be in place for testing.

Step 1 CPAP System Setup

a. Place the test orifice on the outlet of the UUT.

b. Enter the Setup menu and set the pressure to 20 cm H_2O. (See Section 4.2 for instructions).

Step 2 CPAP Current Draw Test

a. Connect the REMstar Pro CPAP System and the Multimeter (Set to Current) in series.

b. Connect the AC power cord to the UUT.

c. Connect the AC power cord to the proper source.

d. Turn the UUT blower on and allow the unit to stabilize for 1 minute.

f. Record the current reading from the multimeter in the space provided on the Testing Data Sheet.

Step 3 Heated Humidifier System Setup

a. Connect the REMstar Pro CPAP System to the Heated Humidifier.

b. Set the Preheat Mode to 5.

Step 4 *Heated Humidifier Current Draw Test*

a. Connect the Respironics Heated Humidifier System power cord and the test leads in series.

b. Connect the test leads to the multimeter.

c. Connect the AC power cord to the UUT.

d. Connect the AC power cord to the proper source.

e. Press the Heated Humidifier button until you hear one audible tone then release.

f. Record the current reading from the multimeter in the space provided on the Testing Data Sheet.

NOTE: Setup remains the same for Step 5.

Step 5 *CPAP / Heated Humidifier Current Draw Test*

a. Turn the UUT blower on and allow the unit to stabilize for 1 minute.

b. Record the current reading from the multimeter in the space provided on the Testing Data Sheet.

Step 6 *Test Complete*

a. Sign and Date the Testing Data Sheet.

REMstar Pro CPAP System with Heated Humidifier Testing Data Sheet

CPAP Testing

Notification No. _____ CPAP Serial No. _____ Model No. _____

Notification No. _____ Humidifier Serial No. _____ Model No. _____

Blower Hours Pre Run-In (B = _____)

Blowers Hours Post Run-In (B = _____)

		Tolerance		Tolerance
CPAP Final Test	4 cm H_2O (_____)	3.6 - 4.4 cm H_2O	20 cm H_2O (_____)	19.6 - 20.4 cm H_2O

Heated Humidifier Testing

Preheat Mode Display Screen Icon Pass _____ Fail _____ Solid Indicator Pass _____ Fail _____

Heating Mode Solid Indicator Pass _____ Fail _____

	Tolerance		Tolerance		Tolerance
Current Draw @ 20 cm H_2O (_____)	< 1.0 A	Current Draw @ 5 Preheat (_____)	< .7 A	Total Current Draw (_____)	< 1.7 A

NOTE: If a section of this Data sheet is not being used, mark that section as NA (Not Applicable)

Date ____ / ____ / ____ Signature (In Ink) _____

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Appendix A: Tools and Equipment

A.1 Service Tools and Supplies A-3

A.2 Acceptable Test Equipment A-4

Notes:

Appendix A: Tools and Equipment

A.1 Service Tools and Supplies

You should have the following hand tools and supplies available for troubleshooting, testing, and repairing the REMstar Pro CPAP System.

- Common Hand Tools

  Flat-blade screwdriver - small

  Phillips screwdriver - medium

- Antistatic, Electro-Static Discharge (ESD)-protected work station - minimum requirement is a grounded mat and wrist strap
- Windows®-compatible personal computer running Windows 95, 98, 2000, NT with a CD-ROM drive
- Utility Software CD (RI P/N 1011422)
- SleepLink Cable (RI P/N 1007492)
- Cleaning Cloth
- Digital Manometer - see Section A.2
- Digital Multimeter - see Section A.2
- Flow Meter - see Section A.2
- Test Leads
- Isopropyl Alcohol
- Mild Detergent
- Pressure Tubing
- Test Orifice (RI P/N 332353)
- Whisper Swivel II (RI P/N 332113)
- Flow control valve
- CPAP (for negative flow)
- O_2 Enrichment Port (RI P/N 312710)

A.2 Acceptable Test Equipment

A.2.1 Digital Manometer*

Specifications:

0 - 25 cm H_2O (or better)

±0.3 cm H_2O accuracy

±0.1 cm H_2O resolution

Acceptable Options:

- Respironics Digital Manometer
- Merical DP2001
- Sensym PDM 200CD
- RT - 200
- Any commercially available digital manometer that meets the above specifications.

* A water column manometer may also be used.

A.2.2 Digital Multimeter

Specifications:

2.5 digit readout minimum

0.0 - 20.0 VDC

0.0 - 25.0 VAC

Acceptable Options:

- Fluke 83 or better model
- Any commercially available multimeter that meets the above specifications.

A.2.3 Flow Meter

Specifications:

Range: +180 to -180 LPM

± 2% accuracy

± 1 LPM resolution

Acceptable Options:

- TSI 4000 Series Flow Meter
- Time Meter RT - 200
- Any commercially available flowmeter that meets the above specifications.

Appendix B: Schematics

Schematic Statement **B-2**

Domestic Microprocessor **B-3**

Domestic Analog Circuit **B-4**

Domestic CPU Board **B-5**

Domestic Display **B-6**

Domestic Power Supply **B-7**

Domestic Motor Driver **B-8**

International Microprocessor **B-9**

International Analog Circuit **B-10**

International CPU Board **B-11**

International Display **B-12**

International Power Supply **B-13**

International Motor Driver **B-14**

Appendix B: Schematics

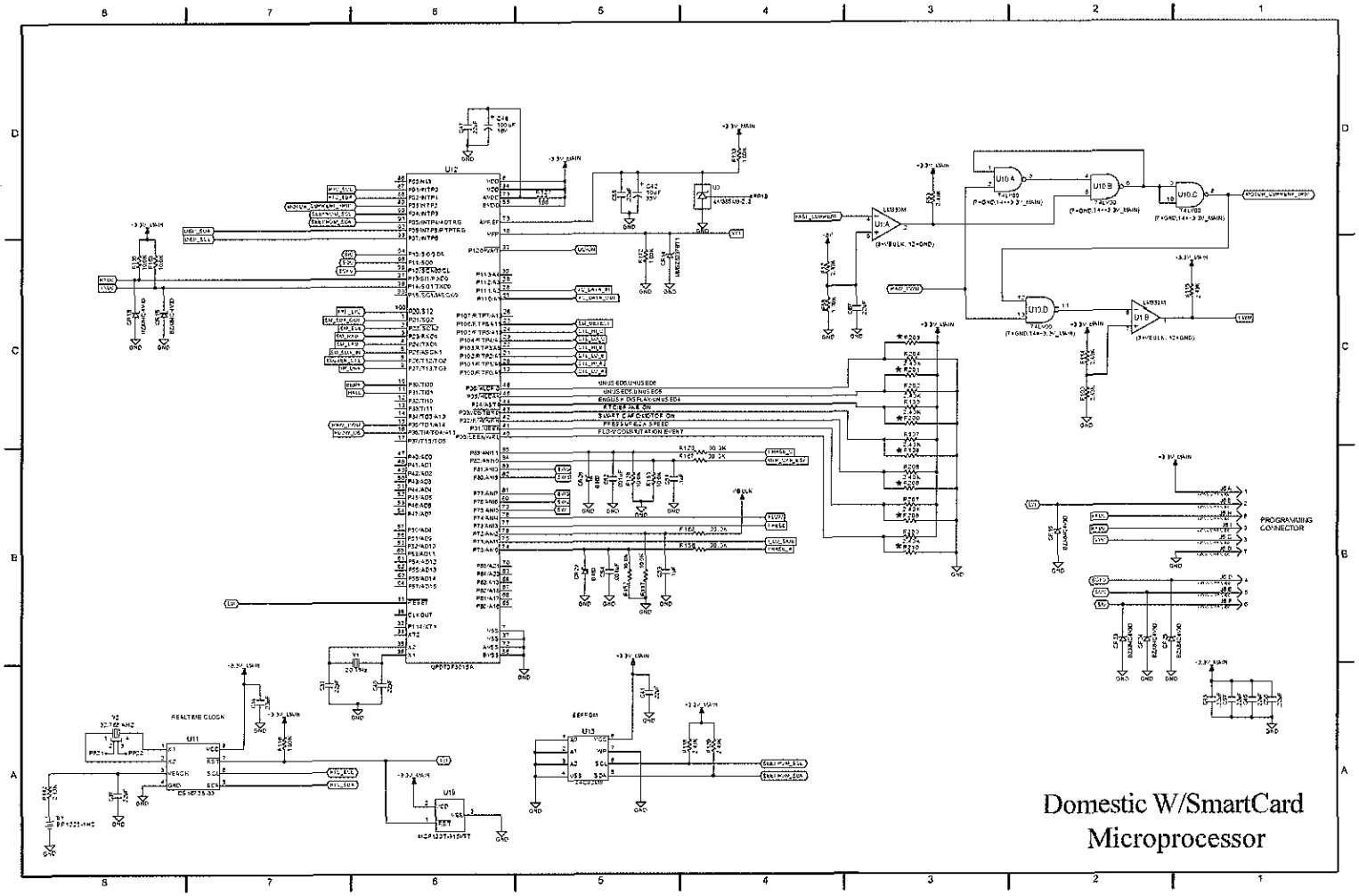
B.1 Schematic Statement

Schematics are supplied with this manual in direct support of the sale and purchase of this product.

The schematics are proprietary and confidential. Do not copy the schematics or disclose them to third parties beyond the purpose for which they are intended. Patents are pending.

The schematics are intended to satisfy administrative requirements only. They are not intended to be used for component level testing and repair. Any changes of components could effect the reliability of the device, prohibit lot tracking of electronic components, and void warranties. Repairs and testing are supported only at the complete board level.

The schematics are of the revision level in effect at the time this manual was last revised. New revisions may or may not be distributed in the future.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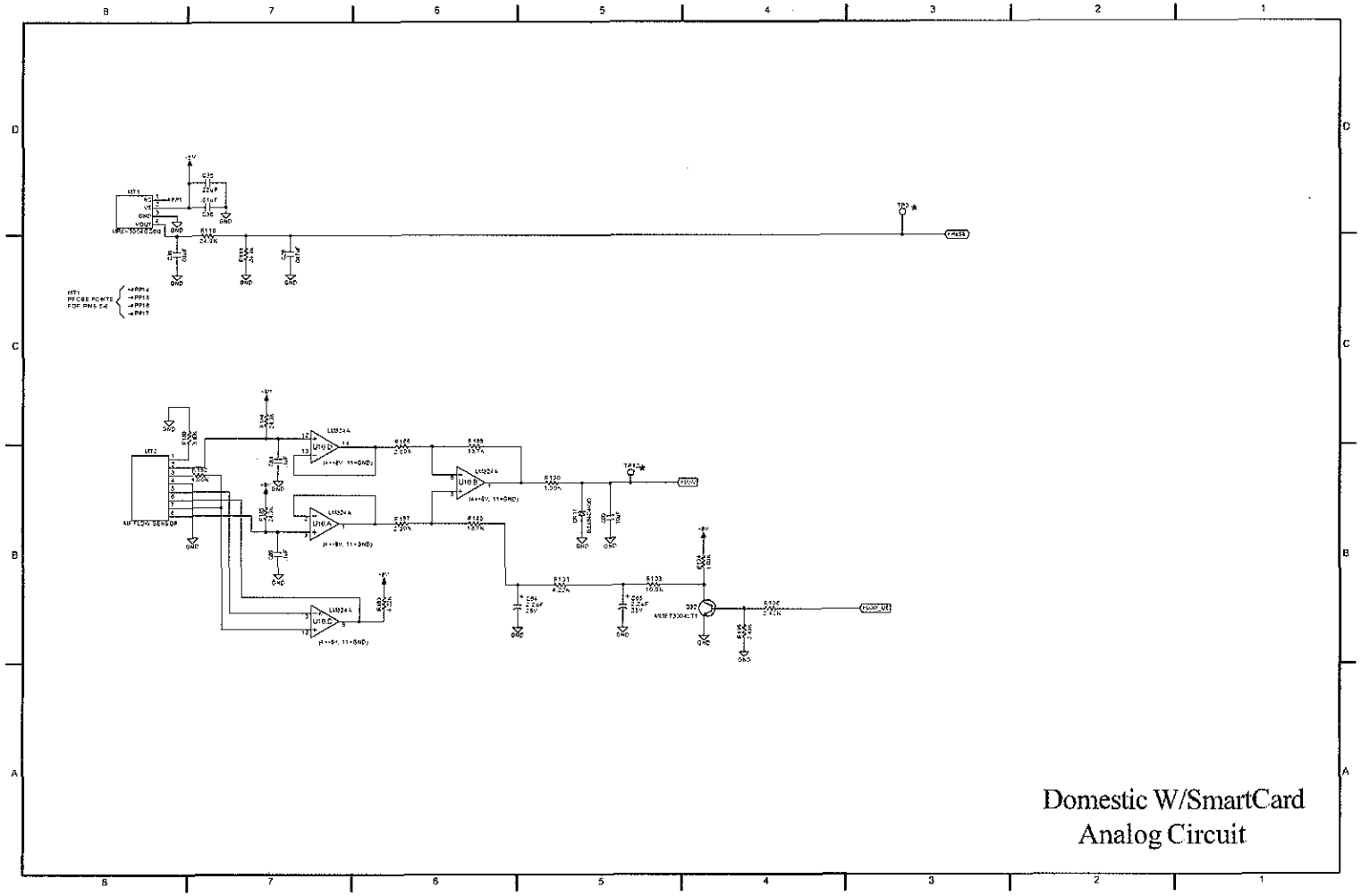
Microprocessor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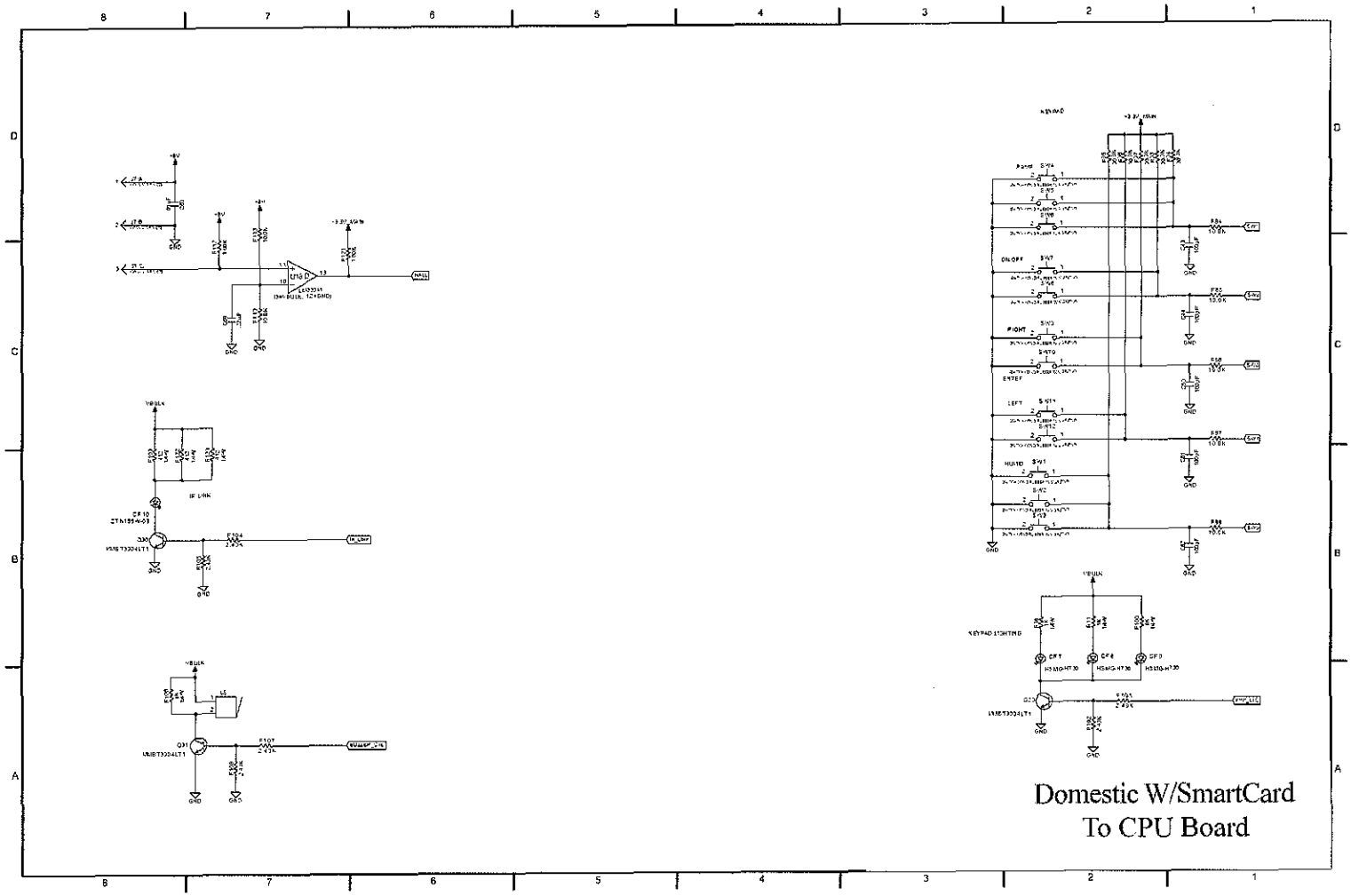
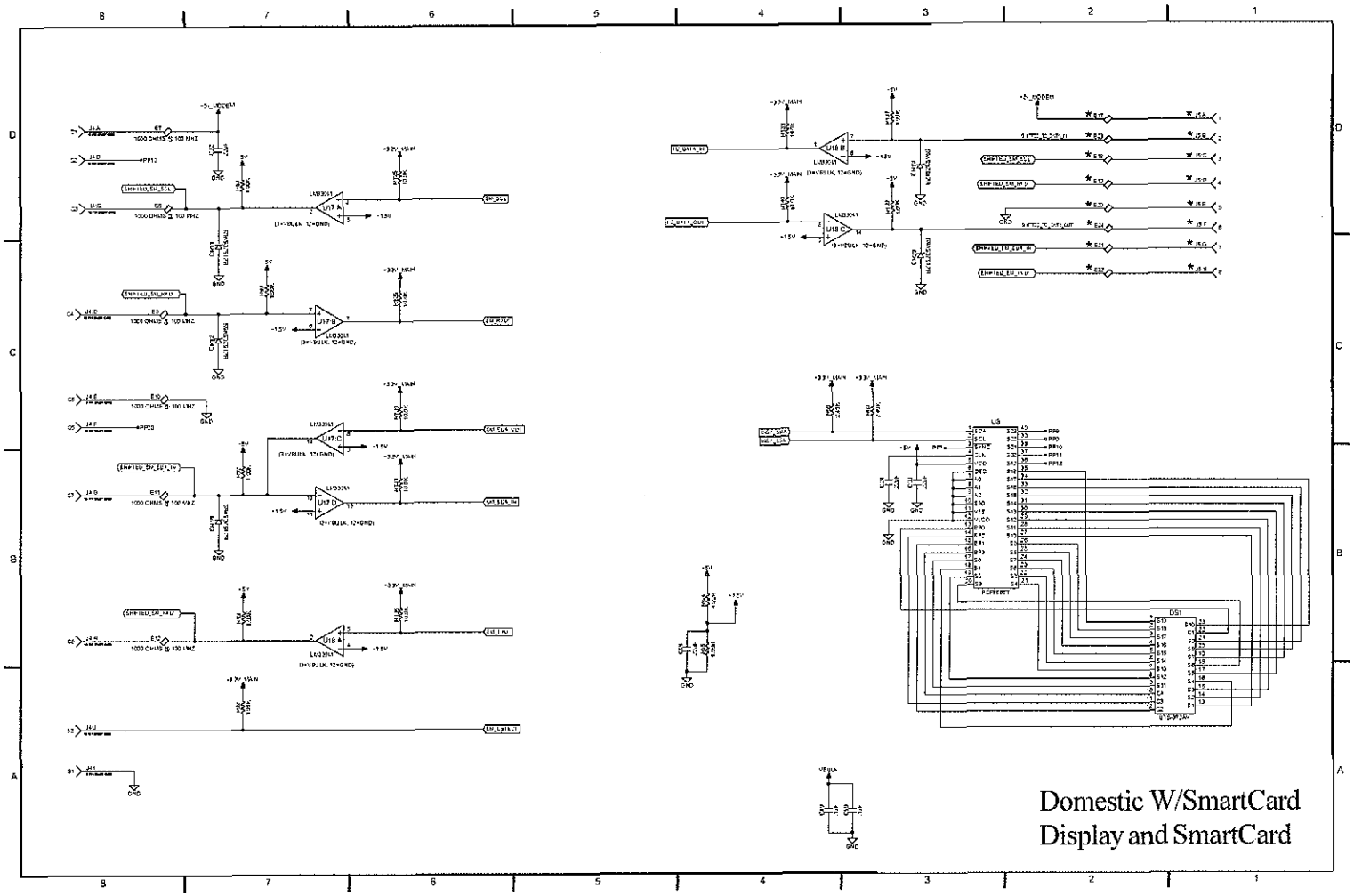


Domestic W/SmartCard
To CPU Board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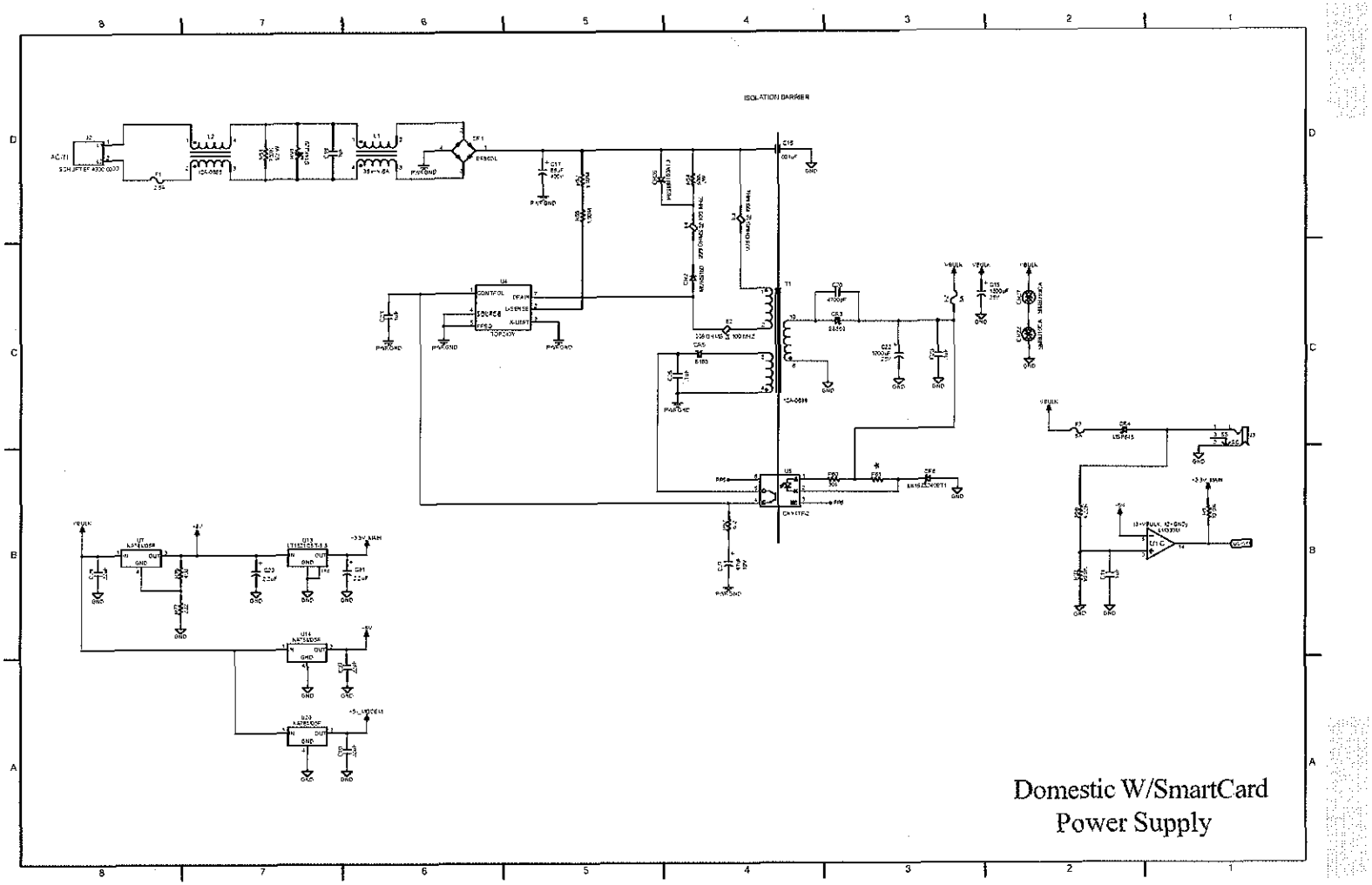
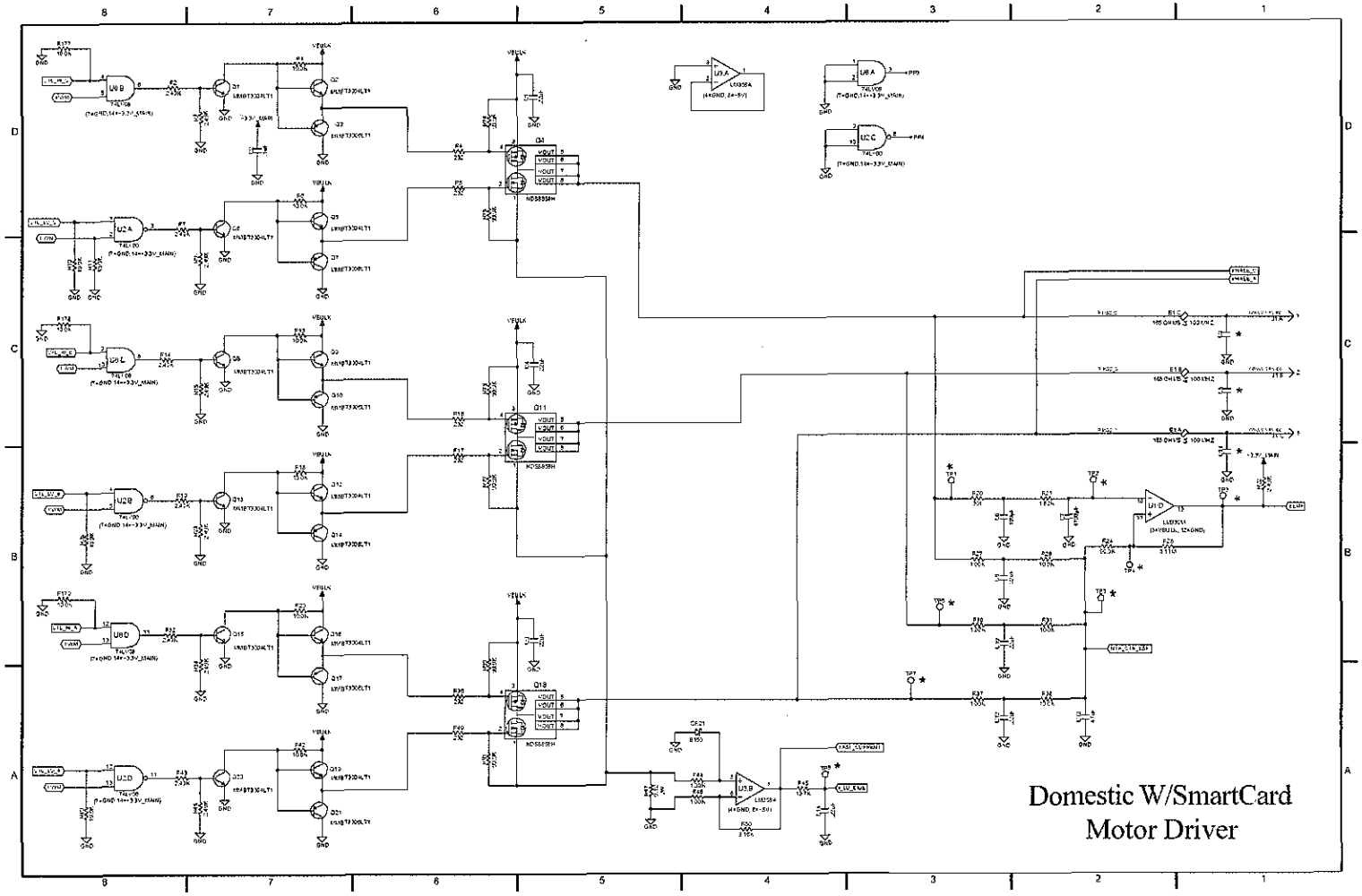
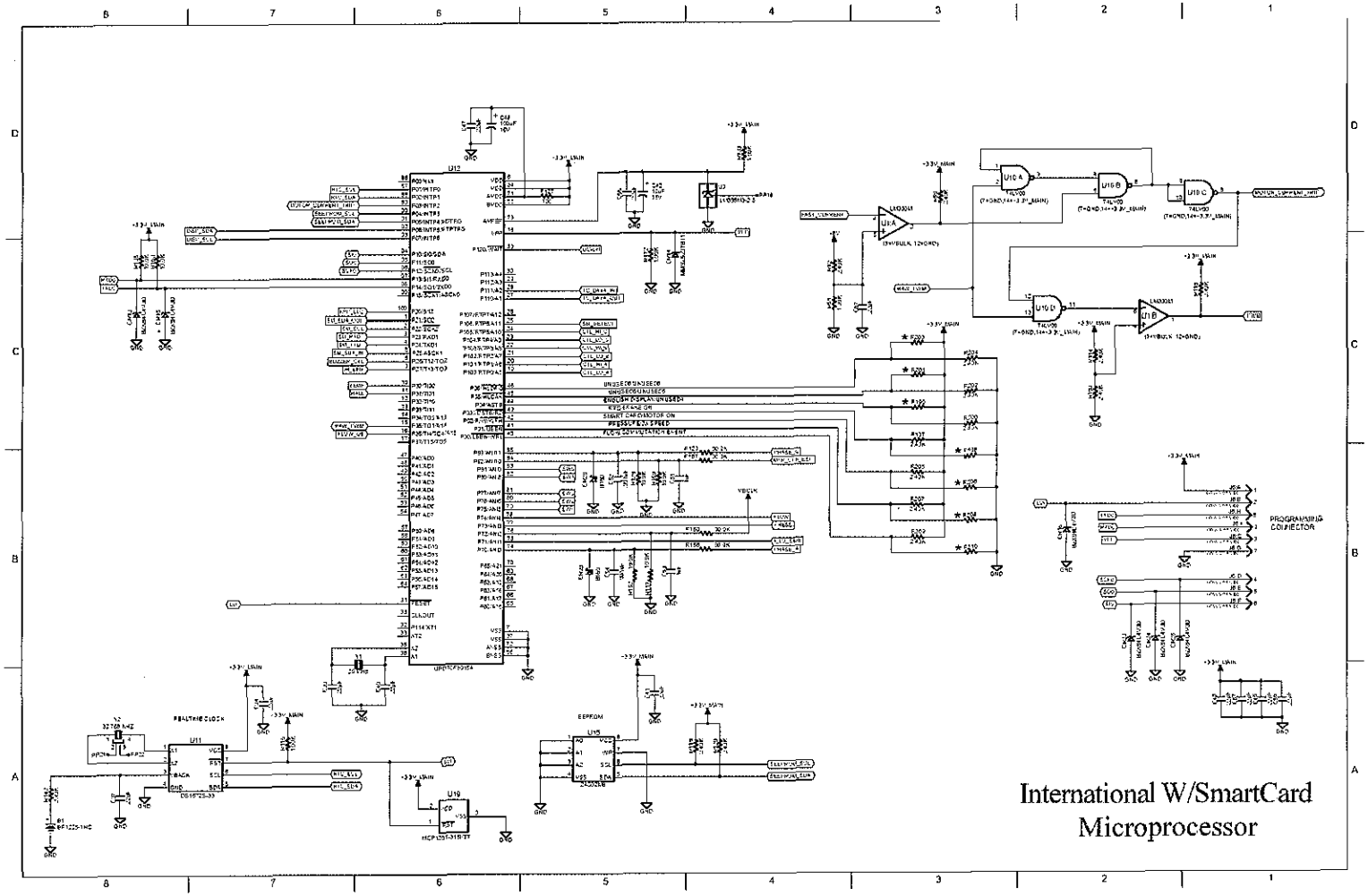
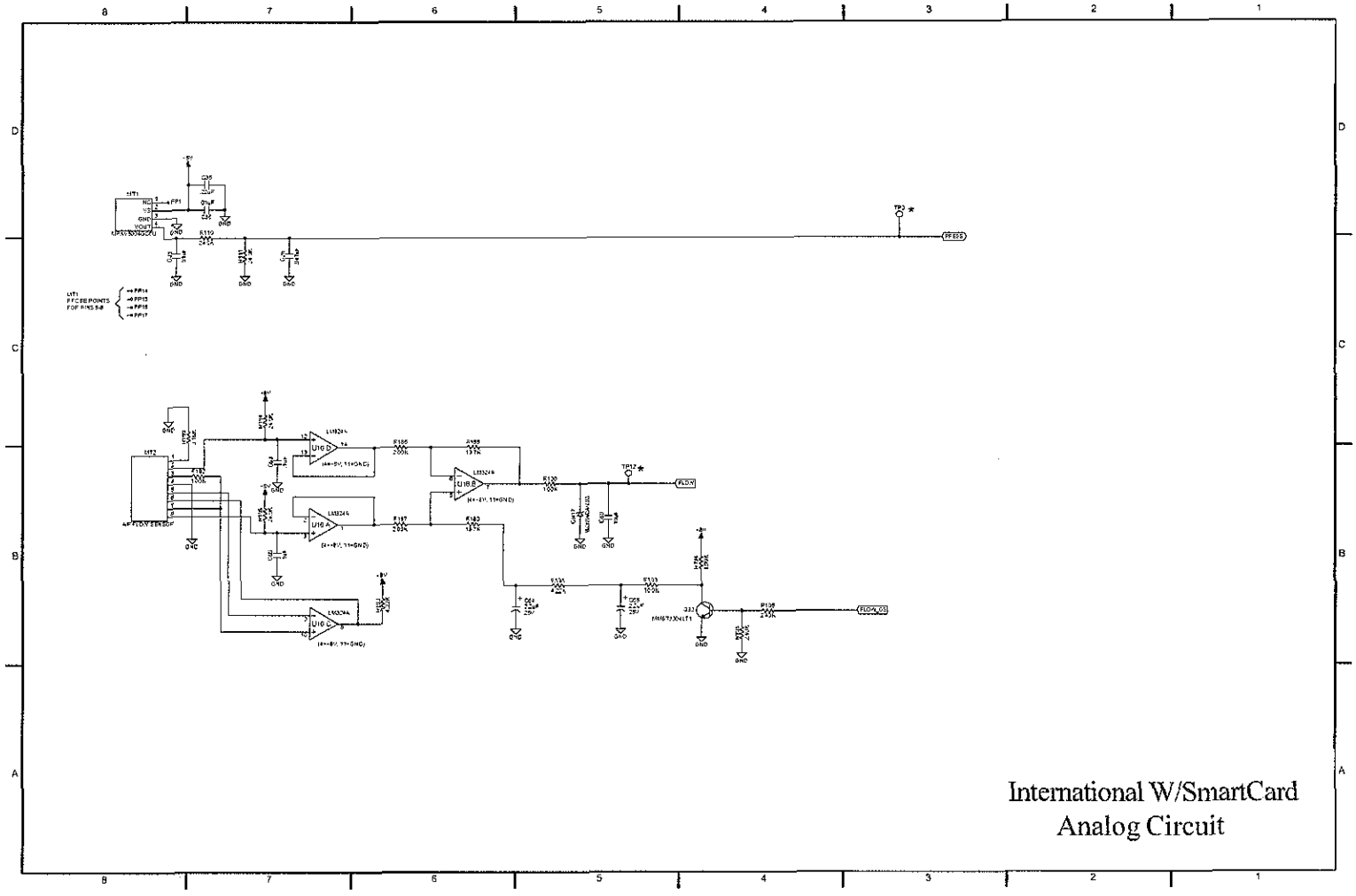
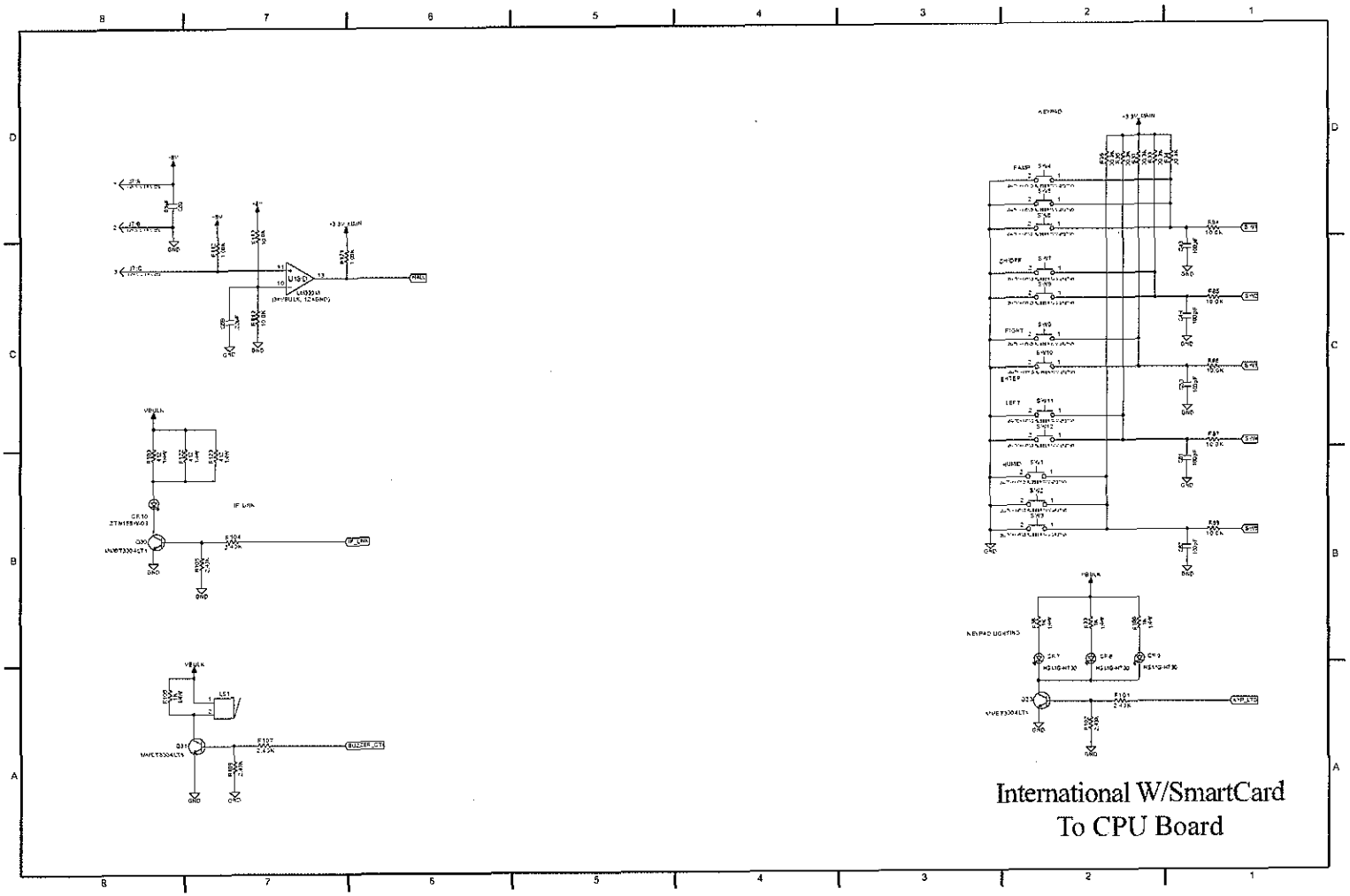
Display and SmartCard

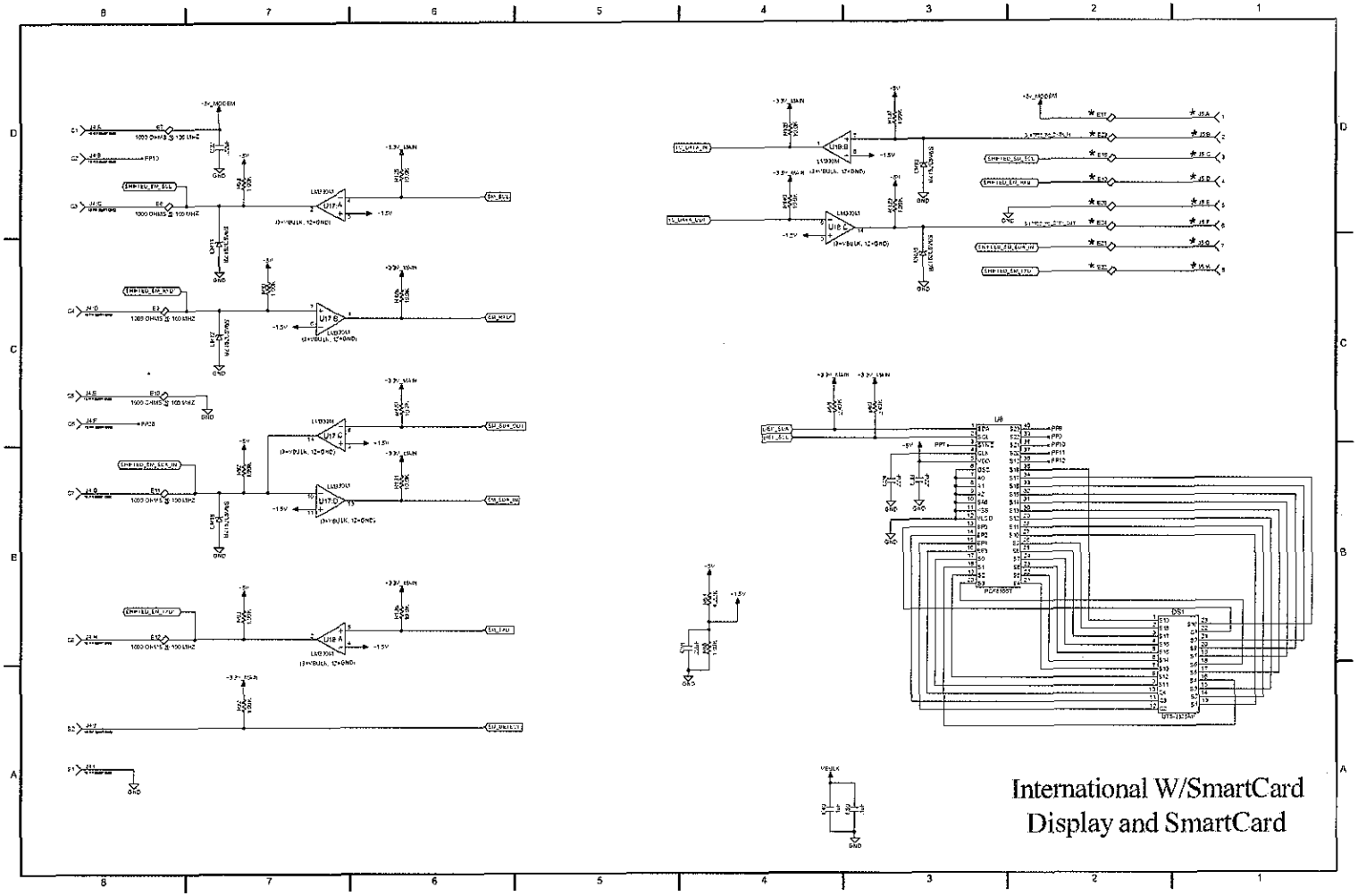

ISOLATION BARRIER
Domestic W/SmartCard
Power Supply

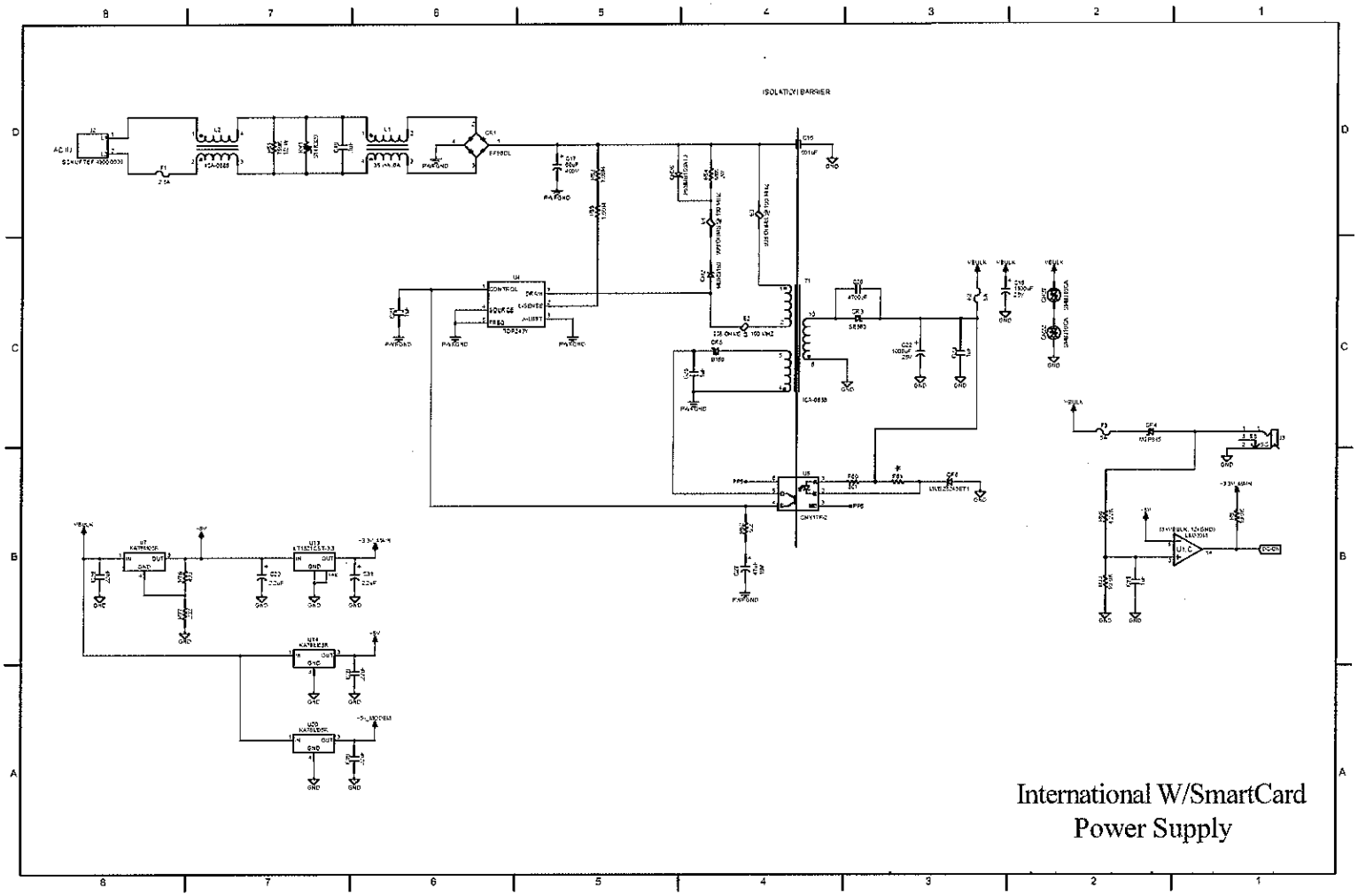

Domestic W/SmartCard
Motor Driver

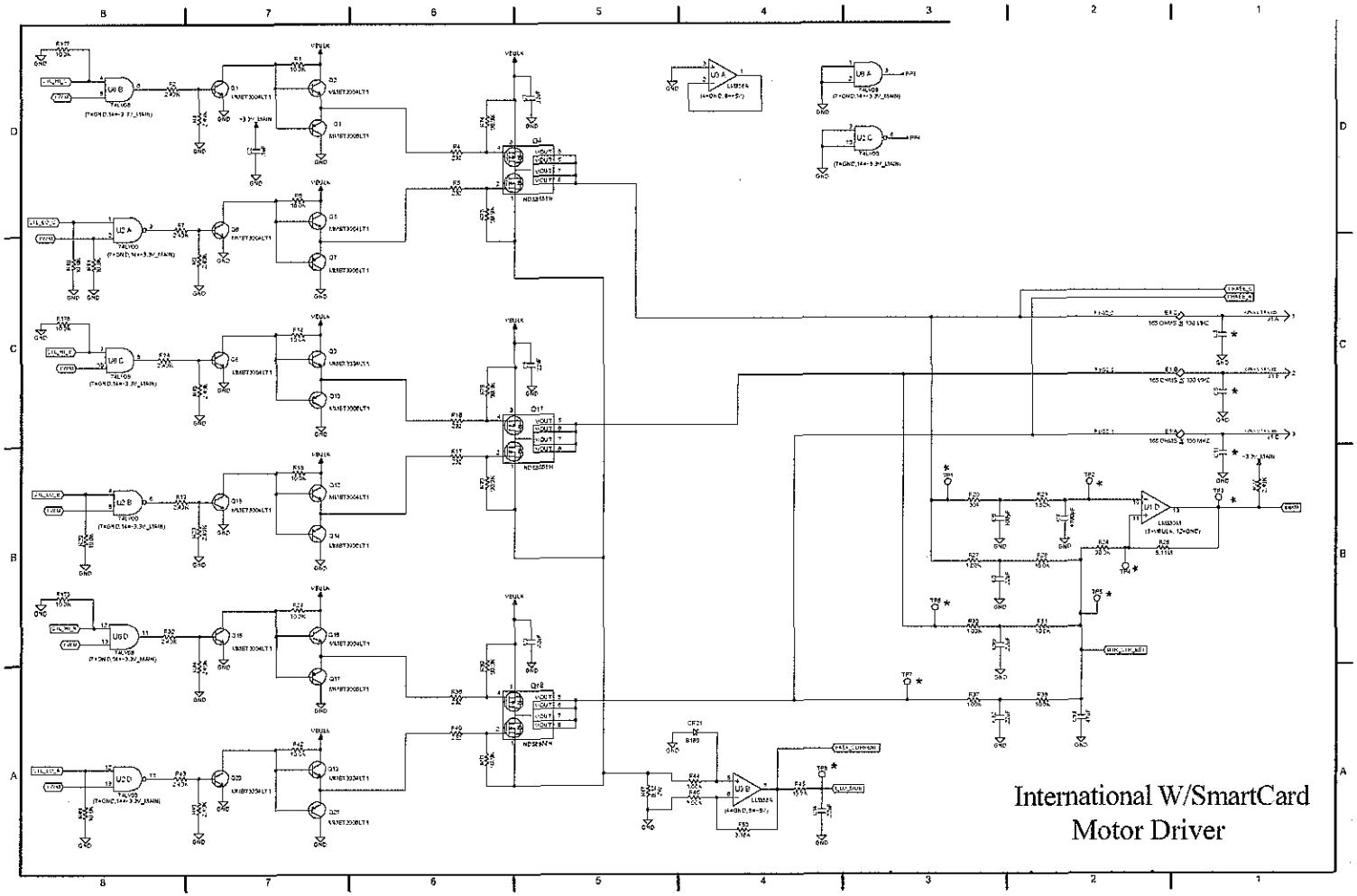

International W/SmartCard
Microprocessor


International W/SmartCard
Analog Circuit


International W/SmartCard
To CPU Board


International W/SmartCard
Display and SmartCard


ISOLATION BARRIER
International W/SmartCard
Power Supply


International W/SmartCard
Motor Driver

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RESPIRONICS INC.®
1001 Murry Ridge Lane
Murrysville, Pennsylvania
15668-8550 USA

RESPIRONICS®
Deutschland
Gewerbestrasse 17
82211 Herrsching Germany

Reorder # 1011171

Revision # 1011170
BLT 09/13/2002